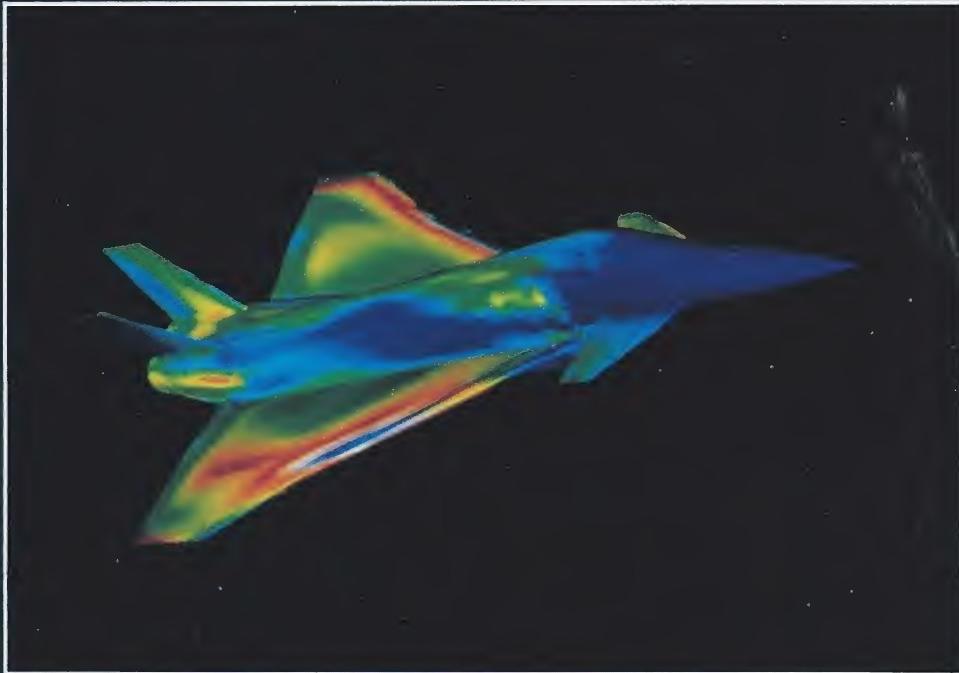
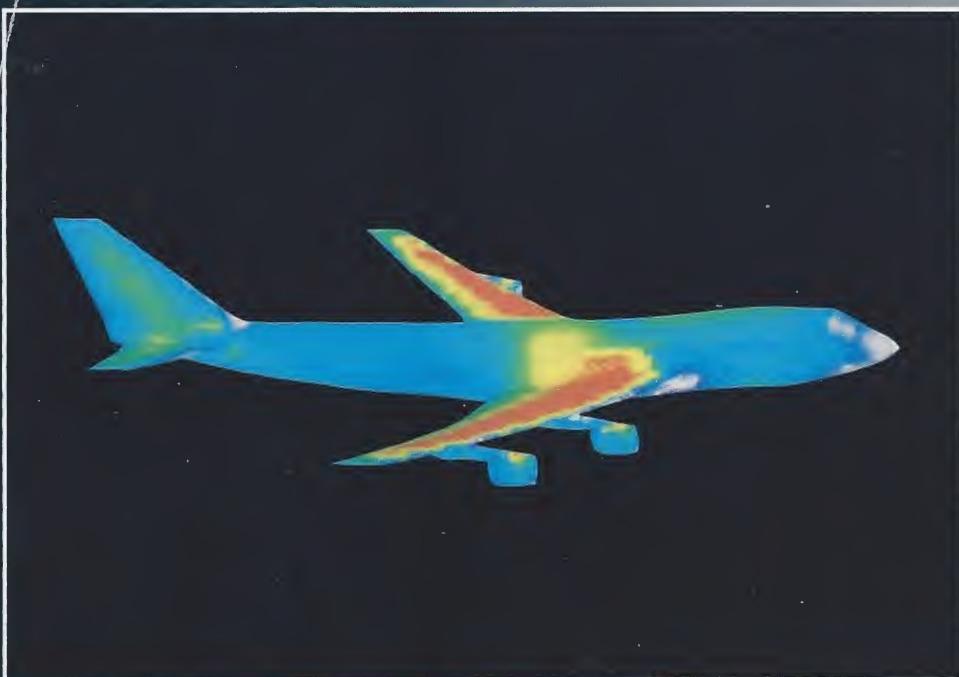


The Imagined Becomes a Reality...



Full Aircraft Aerodynamic Simulation

The long-sought-after goal of aerodynamicists, simulating airflow about complete aircraft, is now reality. Cray supercomputers have enabled recent breakthroughs in software development for computational fluid dynamics (CFD). The large memory and long run times characteristic of CFD make it a natural application for Cray supercomputers, which have large central and secondary memories, outstanding I/O performance, and balanced vector and parallel processor architectures.

Exemplifying the demands of CFD is the installation of a CRAY-2 supercomputer at NASA's Numerical Aerodynamic Simulation facility; the computer's four processors and 256-million-word central memory were deemed essential for solving the three-dimensional Navier-Stokes equations, simulating the airflow about a complete aircraft.

The image at upper left was generated using the MOVIE.BYU solids-modeling program interactively on a CRAY X-MP supercomputer. It displays the aircraft geometry and simulation results on the surface of a Boeing 747. Here, the color illustrates air pressure, with red indicating the lowest pressure and white the highest. This simulation was performed on CRAY X-MP/48 and CRAY X-MP/216 supercomputers using the program AIRPLANE1, a full-aircraft aerodynamics code under development at Princeton University by Tim Baker and Antony Jameson.

The image at lower left also shows a color-coded pressure distribution, in this case on the surface of an advanced aircraft under study by the West German aerospace company Messerschmitt-Bölkow-Blohm (MBB). Albrecht Eberle of MBB has used CRAY X-MP/48 and CRAY X-MP/216 supercomputers to simulate the airflow about this configuration. The bands of low pressure (red in the image) on the upper-wing surface indicate the presence of vortical flow, characteristic of maneuvering fighter aircraft. Of special significance in this computation was the use of multiple processors of the CRAY X-MP supercomputer, resulting in significantly reduced wall-clock times.

Once again, the imagined has become reality on Cray supercomputers.

Picture credit: Both images were produced at Cray Research, Inc., using the MOVIE.BYU solid modeling program from Brigham Young University.

Making the Imagined a Reality. . .

Making the imagined a reality has become commonplace using Cray supercomputers. Previously insolvable problems in the aerospace, petroleum, and automotive industries and in science, engineering, and graphics are being solved today using the power and flexibility of Cray supercomputer systems. In each discipline the Cray supercomputer is used to simulate a real-world process in less time and at less cost.

To support these applications, a wide range of graphic software systems is offered for Cray supercomputers by third-party vendors. Device-independent line-drawing systems like GK-2000 and DI-3000 from Precision Visuals, Inc., TEMPLATE from Megatek, Inc., and DISSPLA from ISSCO, Inc., are being used now on many Cray supercomputers.

Systems for CAD/CAM and pre- and postprocessing like PATRAN from PDA Engineering and MOVIE.BYU from Brigham Young University support a variety of engineering design activities. In those cases where photographic-quality scene generation is the objective, the designers, artists, scientists, and movie-makers are turning to Cray systems to do what could not otherwise be done.

If your application or graphics task requires extraordinary computer power . . . the problems you **can** do are much smaller than the problems you **would** like to do . . . if you need a general purpose powerhouse to run a variety of simulation, engineering, or scientific codes . . . you need a Cray supercomputer!



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